

CLAIMS

1. A write-once-type recording medium comprising:
 - a data area to record therein record data; and
- 5 a plurality of management areas in which a plurality of types of management information for managing the record data and index information for indicating newest management information can be recorded a plurality of times,
 - each of the plurality of management areas having a setup area for
- 10 recording therein a management information block including a plurality of types of management information constructed from the newest management information and the index information indicating the plurality of types of management information constructed from the newest management information.
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2. The write-once-type recording medium according to claim 1, wherein the setup area is prepared at a head position of each of the plurality of management areas or near the head position.
- 20 3. The write-once-type recording medium according to claim 1, wherein the index information is disposed at the end of the plurality of types of management information.
4. The write-once-type recording medium according to claim 1, wherein
- 25 said write-once-type recording medium further comprises a control information recording area to record therein information for controlling

recording and reading with respect to the data area, and
at least one of the plurality of management areas is disposed in the
control information recording area.

5 5. The write-once-type recording medium according to claim 1, wherein
said write-once-type recording medium further comprises a control
information recording area to record therein information for controlling
recording and reading with respect to the data area, and
at least one of the plurality of management areas is disposed between
10 the control information recording area and the data area.

6. The write-once-type recording medium according to claim 1, wherein
the plurality of management areas are dispersedly disposed on a recording
surface of said write-once-type recording medium.

15 7. The write-once-type recording medium according to claim 1, wherein
the plurality of types of management information includes at least one of
defect management information for managing a defect in the data area, space
bitmap information for managing a state of distribution of the record data on
20 the data area and sequential recording management information for
managing a state of distribution of the record data on a recording track to
record the record data.

25 8. A recording apparatus for recording record data onto a
write-once-type recording medium comprising: (i) a data area to record
therein the record data; and (ii) a plurality of management areas in which a

plurality of types of management information for managing the record data and index information for indicating newest management information can be recorded a plurality of times,

said recording apparatus comprising:

5 a first recording device for recording the record data into the data area;

an updating device for updating the index information and at least one of the plurality of types of management information;

10 a detecting device for detecting whether or not the updated index information is to be in a condition such as indicating management information recorded in a different management area;

15 a second recording device for recording the index information and the at least one of the plurality of types of management information which are updated, into an in-use management area, if the updated index information is not to be in the condition such as indicating management information recorded in a different management area; and

20 a third recording device for recording a management information block including a plurality of types of management information constructed from newest management information and the index information, into an un-used management area, if the updated index information is to be in the condition such as indicating management information recorded in a different management area.

9. The recording apparatus according to claim 8, wherein said detecting device detects whether or not the index information is to be in a condition such as indicating management information recorded in a different

management area, on the basis of a free space of the in-use management area.

10. The recording apparatus according to claim 8, wherein said third recording device records the management information block at a head position of the un-used management area or near the head position.
11. The recording apparatus according to claim 8, further comprising an obtaining device for obtaining the plurality of types of management information constructed from newest management information, one the basis of the index information recorded last time.
12. A computer program of instructions for tangibly embodying a program of instructions executable by a computer to make the computer function as the recording apparatus according to claim 8.
13. A recording method of recording record data onto a write-once-type recording medium comprising: (i) a data area to record therein the record data; and (ii) a plurality of management areas in which a plurality of types of management information for managing the record data and index information for indicating newest management information can be recorded a plurality of times,
said recording method comprising:
a first recording process of recording the record data into the data area;
an updating process of updating the index information and at least

one of the plurality of types of management information;

a detecting process of detecting whether or not the updated index information is to be in a condition such as indicating management information recorded in a different management area;

5 a second recording process of recording the index information and the at least one of the plurality of types of management information which are updated, into an in-use management area, if the updated index information is not to be in the condition such as indicating management information recorded in a different management area; and

10 a third recording process of recording a management information block including a plurality of types of management information constructed from newest management information and the index information, into an un-used management area, if the updated index information is to be in the condition such as indicating management information recorded in a different
15 management area.

14. A write-once-type recording medium comprising:

 a data area to record therein record data; and

20 a plurality of management areas in which a plurality of types of management information for managing the record data and index information for indicating newest management information can be recorded a plurality of times,

 all management information indicated by a newest index information being disposed in one of the plurality of management areas.

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15. The write-once-type recording medium according to claim 14 wherein

the all management information indicated by the newest index information is disposed at a head position of the one of the plurality of management area or near the head position.

5 16. The write-once-type recording medium according to claim 14, wherein
the index information is disposed at the end of the plurality of types of
management information.

10 17. The write-once-type recording medium according to claim 14, wherein
said write-once-type recording medium further comprises a control
information recording area to record therein information for controlling
recording and reading with respect to the data area, and
the management area is disposed in the control information recording
area.

15 18. The write-once-type recording medium according to claim 14, wherein
the management area is disposed between the control information recording
area and the data area.

20 19. The write-once-type recording medium according to claim 14, wherein
the plurality of management areas are dispersedly disposed on a recording
surface of said write-once-type recording medium.

25 20. The write-once-type recording medium according to claim 14, wherein
the plurality of types of management information includes at least one of
defect management information for managing a defect in the data area, space

bitmap information for managing a state of distribution of the record data on the data area and sequential recording management information for managing a state of distribution of the record data on a recording track to record the record data.

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21. A recording apparatus for recording record data onto a write-once-type recording medium comprising: (i) a data area to record therein the record data; and (ii) a plurality of management areas in which a plurality of types of management information for managing the record data and index information for indicating newest management information can be recorded a plurality of times,

10 said recording apparatus comprising:
a first recording device for recording the record data into the data area;

15 a detecting device for detecting the management area in which newest index information is recorded;

an updating device for updating the management information and the index information;

20 a judging device for judging whether or not the index information and the management information which are updated by said updating device can be recorded into the management area which is detected by said detecting device; and

25 a second recording device for recording the updated index information and all management information indicated by the updated index information, into another management area in which the updated index information and the all management information indicated by the updated index information

can be recorded, if it is judged by said judging device that the index information and the management information which are updated cannot be recorded.

- 5 22. The recording apparatus according to claim 21, wherein the another
management area is an un-used management area.
23. The recording apparatus according to claim 21, wherein said judging
device judges whether or not the index information and the management
10 information which are updated by said updating device can be recorded into
the management area, on the basis of a free space of the management area
which is detected by said detecting device.
24. A recording apparatus for recording record data onto a
15 write-once-type recording medium comprising: (i) a data area to record
therein the record data; and (ii) a plurality of management areas in which a
plurality of types of management information for managing the record data
and index information for indicating newest management information can be
recorded a plurality of times,
- 20 said recording apparatus comprising:
a first recording device for recording the record data into the data
area; and
a second recording device for recording all management information
indicated by newest index information into one of the management areas.
25. A recording method of recording record data onto a write-once-type

recording medium comprising: (i) a data area to record therein the record data; and (ii) a plurality of management areas in which a plurality of types of management information for managing the record data and index information for indicating newest management information can be recorded a plurality of times,

5 said recording method comprising:
a first recording process of recording the record data into the data area;

10 a detecting process of detecting the management area in which newest index information is recorded;

an updating process of updating the management information and the index information;

15 a judging process of judging whether or not the index information and the management information which are updated by said updating process can be recorded into the management area which is detected by said detecting process; and

20 a second recording process of recording the updated index information and all management information indicated by the updated index information, into another management area in which the updated index information and the all management information indicated by the updated index information can be recorded, if it is judged by said judging process that the index information and the management information which are updated cannot be recorded.

25 26. A reproducing apparatus for reproducing record data recorded on a write-once-type recording medium comprising: (i) a data area to record

therein the record data; and (ii) a plurality of management areas in which a plurality of types of management information for managing the record data and index information for indicating newest management information can be recorded a plurality of times,

5 said reproducing apparatus comprising:

 a detecting device for detecting the management area in which newest index information is recorded;

 an extracting device for extracting the newest index information in the management area which is detected by said detecting device;

10 an obtaining device for obtaining all management information in one of the management areas indicated by the index information which is extracted by said extracting device; and

 a reproducing device for reproducing the record data, on the basis of the management information obtained by said obtaining device.

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27. A reproducing method of reproducing record data recorded on a write-once-type recording medium comprising: (i) a data area to record therein the record data; and (ii) a plurality of management areas in which a plurality of types of management information for managing the record data and index information for indicating newest management information can be recorded a plurality of times,

 said reproducing method comprising:

 a detecting process of detecting the management area in which newest index information is recorded;

25 an extracting process of extracting the newest index information in the management area which is detected by said detecting process;

an obtaining process of obtaining all management information in one of the management areas indicated by the index information which is extracted by said extracting process; and

a reproducing process of reproducing the record data, on the basis of

- 5 the management information obtained by said obtaining process.